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nebula, appears on plates of July 21st, 23rd, 28th, 29th. Novae 14 and 15 lie almost on the minor axis of the nebula, on opposite sides of the nucleus.

ESTIMATED MAGNITUDES OF NO. 15

July	21	17.2
	23	17.0
	28	17.3
	29	17.5
Aug.	24	18.0

No. 16, discovered by Shapley, approximately 200" west, 190" south of nucleus, nearly superposed upon a nebulous spot of magnitude 18.5, appears first on a plate made by Benioff on August 1st at the secondary focus of the 60-inch, with estimated magnitude 17.1. It appears on subsequent plates by Duncan and Sanford. The nova was verified visually by Shapley August 2nd at the secondary focus of the 100-inch telescope—apparently the first visual record of a nova in the *Andromeda* nebula since No. 1 appeared in 1885.

HARLOW SHAPLEY,  
J. C. DUNCAN.

THE COMETS OF 1919

After a prolonged period with no new comet discoveries, three comets have now been found, the last two within three days of each other.

The first comet of 1919 was found by Wolf at Heidelberg. It was not, however, an unexpected comet, for it was located with the assistance of a search ephemeris by Ebell. It was first seen in 1906, having then been discovered by Kopff, whose name is therefore attached to it. It was not very bright at that apparition, but it was observed quite well, and an accurate orbit was computed. It passed perihelion again in 1913, but was not seen, as it was in the same region of the sky as the Sun.

This year it is much better situated, and has been observed repeatedly since its rediscovery. It has been scarcely as bright as a 10th magnitude star, and it is steadily becoming fainter. On June 29th occurred the closest approach to the Sun, the distance being 1.7 astronomical units, or 160,000,000 miles. Near the middle of June it was nearest the Earth; at that time the distance was 65,000,000 miles. During most of the present apparition, Kopff's comet has remained in the southern part of the constellation

*Aquila*, its motion has been eastward, and slowly northward. It will doubtless be followed for some weeks more before it gets beyond the range of large telescopes. Kopff's comet is interesting mainly in that it is periodic. It is one of the many comets belonging to the *Jupiter* family. If undisturbed this comet should reappear in the early part of 1926.

A much more interesting comet is the second of 1919, discovered by Rev. Joel H. Metcalf, at Camp Idlewild, Vermont. This comet, first announced as an unexpected one, was found by Professor Leuschner to be identical with Brorsen's comet of 1847.

At the discovery date, August 20th, the comet was in the constellation *Pegasus*. It moved rapidly northwest, thru the constellations of *Cepheus* and *Draco*, and in less than two weeks it had reached a high northern declination. At the same time the brightness increased till it was brighter than the 7th magnitude; perhaps it might have been seen by a keen eye without telescopic aid. Then it turned south again, and at the present time is in the constellation *Ursa Major*, and is steadily moving southward and towards the Sun. By the first of October it will be so close to the Sun as not to be visible, and a little later it will be beyond the Sun, in the morning sky. It will remain in the morning sky for some time, rising a little before the Sun, and observation of it will not be very easy. Since the beginning of September the brightness has been steadily diminishing.

Metcalf's first comet will be at a least distance of 45,000,000 miles from the Sun on October 16th. It was closest to the Earth on September 5th, the distance being 18,000,000 miles. Now it is increasing rapidly, which accounts for the diminishing brightness and slower apparent speed across the sky.

The preliminary elements were computed at the Lick Observatory by Miss M. L. Heger and the writer. It was from these elements that Professor Leuschner announced the identity with Brorsen's comet of 1847. Two other sets of elements have now been derived, using a larger time interval, which quite conclusively show the character of a long-period ellipse. The period of 72 years shows that the comet belongs to the *Neptune* family, the one of which Halley's comet is also a member.

In appearance Brorsen's comet is not striking. It is quite diffuse, condensed in the center, but with neither nucleus nor tail.<sup>1</sup> Nor

<sup>1</sup>No tail is visible to the eye. See note by Nicholson and Humason on photographs of the tail.

is there any record of its having presented unusual features at its appearance in 1847. It will be observed as long as possible, of course, in order to furnish observational material with which to determine the time of its next apparition.

The third comet of 1919 was also discovered by Rev. Joel H. Metcalf. This comet was likewise unexpected, and is, so far as we know now, new.

At discovery it was in the constellation *Bootes*. The motion, in comparison to Metcalf's first comet, is rather slow. It has been moving slowly southeastward, and by the first of October it will have moved from *Bootes* into the southwestern part of *Serpens*.

Preliminary elements for this comet were also determined at the Lick Observatory by Miss M. L. Heger and the writer. These elements suffice to show the principal characteristics of the orbit. Deviation from a parabola is not yet manifest, tho with a longer arc it might become so. The perihelion passage, or closest approach to the Sun, does not occur till December 18th, and the distance from the Sun is about 150,000,000 miles. At the present time the comet is slowly approaching the Earth also, but after the first part of October the distance will increase. At the present time the distance is about 230,000,000 miles.

In appearance it is very different from Metcalf's first comet, in that it has a sharp nucleus. The surrounding nebulosity is more condensed, but there is no tail. In brightness it seems to be equal to an 8th magnitude star.

The comet will be followed for some time before it is lost in the rays of the Sun. Not till early next year will it be beyond the Sun in the morning sky and it will then be far south and at a great distance from the Earth. Perhaps it may be observed at some southern observatory.

H. M. JEFFERS.

Lick Observatory,

September 20, 1919.

#### MEASURES OF THE DISK SURROUNDING NOVA AQUILAE, No. 3

*Nova Aquilae* was examined with the 36-inch refractor on four nights from August 17th to September 4th, using the 520 and 1000-power eye-pieces. At the ordinary stellar focus the nova appears as a yellow-white star surrounded by a bluish-green nebulous atmosphere which forms a halo more than five seconds of arc in